APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
09/750,403	12/28/2000	Van Jacobson	112025-0175	6925

24267 7590 04/20/2004		EXAMINER	
CESARI AND MCKENNA, LLP		NGUYEN, ALAN V	
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BOSTON, MA 02210	ART UNIT	PAPER NUMBER	
	2662		

DATE MAILED: 04/20/2004

Please find below and/or attached an Office communication concerning this application or proceeding.

PTO-90C (Rev. 10/03)

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE <u>3</u> MONTH(S) FROM
THE MAILING DATE OF THIS COMMUNICATION.
- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed
  after SIX (6) MONTHS from the mailing date of this communication.
- If the period for reply specified above is less than thirty (30) days, a reply within the statutory minimum of thirty (30) days will be considered timely.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133).
  Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any
  earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☐ Responsive to communication(s) filed on _____.

2a)☐ This action is **FINAL.**   2b)☒ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is
closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) *1-16* is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☐ Claim(s) _____ is/are allowed.

6)☒ Claim(s) *1-16* is/are rejected.

7)☐ Claim(s) _____ is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☒ The drawing(s) filed on *28 December 2000* is/are: a)☒ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☐ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☐ All   b)☐ Some * c)☐ None of:

1.☐ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage
application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☒ Notice of References Cited (PTO-892)

2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)

3) ☒ Information Disclosure Statement(s) (PTO-1449 or PTO/SB/08)
Paper No(s)/Mail Date *2, 3*.

4) ☐ Interview Summary (PTO-413)
Paper No(s)/Mail Date. _____ .

5) ☐ Notice of Informal Patent Application (PTO-152)

6) ☐ Other: _____ .

DETAILED ACTION

Specification

1.   The disclosure is objected to because of the following informalities:

On page 3 line17, a closed parenthesis should be added at the end of the

phrase "Version 4.1".

Appropriate correction is required.

2.   The title of the invention is not descriptive. A new title is required that is clearly

indicative of the invention to which the claims are directed.

The following title is suggested: "Random Early Detection Policer Using

Exponential Weighted Moving Average and Randomization of Packet Drops".

Claim Objections

3.   **Claim 12** is objected to because of the following informalities:

On line 6, "should to" should read "should be".

4.   **Claim 14** is objected to because of the following informalities:

On line 6, "should to" should read "should be".

Appropriate correction is required.

Claim Rejections - 35 USC § 101

5.   35 U.S.C. 101 reads as follows:

Whoever invents or discovers any new and useful process, machine, manufacture, or composition of
matter, or any new and useful improvement thereof, may obtain a patent therefor, subject to the
conditions and requirements of this title.

6.   Claim 16 is rejected under 35 U.S.C. 101 because the claimed invention is

directed to non-statutory subject matter. **Claim 16** discloses electromagnetic signals

propagating over a computer network, for the use of carrying instructions, because it is

directed to a signal per se.

Claim Rejections - 35 USC § 102

7.   The following is a quotation of the appropriate paragraphs of 35 U.S.C. 102 that

form the basis for the rejections under this section made in this Office action:

> A person shall be entitled to a patent unless –
>
> (e) the invention was described in (1) an application for patent, published under section 122(b), by another filed in the United States before the invention by the applicant for patent or (2) a patent granted on an application for patent by another filed in the United States before the invention by the applicant for patent, except that an international application filed under the treaty defined in section 351(a) shall have the effects for purposes of this subsection of an application filed in the United States only if the international application designated the United States and was published under Article 21(2) of such treaty in the English language.

8.   Claims 1, 2, 4-10, and 12-15 are rejected under 35 U.S.C. 102(e) as being

anticipated by Silberschatz et al (US 6,556,578) hereafter Silberschatz.

Regarding **claims 1 and 8** Silberschatz discloses a policer based on Random

Early Detection (RED), comprising:

a filter that determines a filtered virtual time debt **(According to the instant**

application the filtered virtual time debt is the exponential weighted moving

average, EWMA, which is the average packet flow with a weight factor to

determine how previously inputted packets affect the mean value compared to

more recent packets. Silberschatz discloses in [figure 2a, step 32] a global

average queue time, which is the same as the EWMA, where the average is

recomputed on the arrival of each new packet at the buffer. This global average

queue time is equivalent to the filtered virtual time debt of the instant application;

for example see col 4 lines 12-26) and

a control law circuit that receives the filtered virtual time debt from the filter and

determines whether a packet should be dropped **(Once a global average queue**

occupancy is determined, it is compared to a maximum threshold. When the

average is greater than the maximum threshold, a packet drop is warranted [steps

34, 36]. Preferably, if average does not exceed the maximum threshold but is

greater than a minimum threshold [step 38], a dynamically generated probability

is determined [step 40] and applied; col 4 lines 27-40).

Regarding **claims 12 and 14** Silberschatz discloses a method and computer

readable medium of policing packets in a network device, the method comprising the

steps of:

determining a filtered virtual time debt of a traffic **(The first step in this portion**

of the process is to determine an average global queue occupancy [figure 2a,

step 32] Preferably, the global average queue occupancy is determined using an

exponential weighted moving average filter, where the average is recomputed on

the arrival of each new packet at the buffer; for example see col 4 lines 12-26);

comparing the filtered virtual time debt with a predetermined minimum threshold;

and if the filtered virtual time debt exceeds the minimum threshold **(Once a global**

average queue occupancy is determined and it does not exceed the maximum

threshold but is greater than a minimum threshold [step 38], a dynamically

generated probability p.sub.a is determined [step 40] and applied such that the

probability of a packet drop indication being provided is p.sub.a; col 4 lines 27-

40), then

generating a random number that is used to determine which packet should to

dropped **(One method of doing this is to generate a random number r having a**

value between zero and maximum probability, and then indicating that a packet

must be dropped when the random value is less than or equal to the maximum

probability; col 4 lines 34-40).

Regarding **claim 2** Silberschatz discloses a virtual time debt uses a time T in which a

packet is expected to arrive and is computed using a predetermined output transmission

rate **(Silberschatz discloses in col 4 lines 18-25 that the article "Dynamics of**

Random Early Detection" by Jacobson et al. is incorporated by reference. In the

instant application, T is described as the sample time. Jacobson discloses the

use of a sampling frequency that is a function of the output rate; section 4.4).

Regarding **claim 4** Silberschatz discloses the RED policer of claim 1, wherein the filter

is based on an exponential weighted moving average (EWMA) virtual time delay using

the expression, EWMA = (1-g) EWMA+ g (VTD), **(Jacobson discloses in section 4.5**

column 2, a "calculate average queue length" formula that uses the same

variables for the equation [avg = (1-wq)*avg + wq*q]. "Avg" is EWMA, wq is the

filter gain, g, and q is the sampled queue size at the instant time, which is

equivalent to the time debt (VTD, difference of packet time arrival); section 4.4,

4.5).

Regarding **claims 5 and 9** Silberschatz discloses a sampler that samples a virtual time

debt at a sampling interval, and transmits the sampled virtual time debt to the filter

(Jacobson discloses the use of sampling the arrival and departure times of the

packets, used for calculation of the EWMA; section 4.4).

Regarding **claims 6, 10, 13, and 15** Silberschatz discloses a random generator that

generates a number based on the control law circuit's determination as to whether a

packet should be dropped **(One method of doing this is to generate a random**

number r having a value between zero and maximum probability, and then

indicating that a packet must be dropped when the random value is less than or

equal to the maximum probability; col 4 lines 34-40); and a counter that is set with

the number generated by the random generator, wherein the counter counts packets

passing through the RED policer up to the set number, and wherein the RED policer

drops a packet when the counter has counted out the set number **(after selection of a**

random number, the packet is dropped when the random value is less than or

equal to the maximum probability. The count value can be incremented every

time max probability is computed and reset to zero whenever a packet is

dropped. The initial packet dropping probability is empirically chosen based on

link speeds to ensure an appropriate number of packet drops per second when the minimum queue length threshold is exceeded; col 4 lines 34-57).

Regarding **claim 7** Silberschatz discloses the control law circuit that determines a probability of a packet being dropped based on the filtered time debt exceeding a predetermined minimum threshold, and specifies a range of numbers based on the probability **(if the queue average does not exceed the maximum threshold but is greater than a minimum threshold [step 38], a dynamically generated probability p.sub.a is determined [step 40] and applied such that the probability of a packet drop indication being provided is p.sub.a; col 4 lines 26-40)**; and the random generator that randomly generates a number in the range specified by the control law circuit **(One method of doing this is to generate a random number r having a value between zero and the maximum value of p.sub.a, and then indicating that a packet must be dropped when r is less than or equal to p.sub.a [steps 42, 36]. If the average is less than the minimum threshold, then no packet drop indication is provided. [Steps 44, 38]; col 4 lines 26-40).**

Claim Rejections - 35 USC § 103

9.   The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

10.   Claim 3 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Silberschatz in view of Gvozdanovic (US 6,600,720).

Regarding **claim 3** Silberschatz fails to expressly disclose where the

predetermined output transmission rate is a given by a traffic contract.

Gvozdanovic discloses a network system that manages traffic through

congestion control and policers **(The rate counter may be replaced by a unit that**

performs a traffic policing algorithm, such as the generic cell rate algorithm. This

unit provides outputs which are indicative of how the near the traffic is to the

limits of the traffic contract and these outputs are fed to the congestion control

algorithm; for example see col 10 lines 20-46).

It would have been obvious to one having ordinary skill in the art at the time the

invention was made to modify Silberschatz's apparatus to utilize a traffic contract

between network nodes to limit excessive data transmissions as taught by

Gvozdanovic. The motivation is that traffic contracts provide yet another method to help

control and reduce congestion in addition to the traffic control methods that are

disclosed in Silberschatz's embodiment. This makes the system more effective in that

traffic is more predictable since there are set limits for the nodes to transmit data as

shown by Gvozdanovic on column 1 lines 37-53.

11.   Claim 11 is rejected under 35 U.S.C. 103(a) as being unpatentable over

Silberschatz in view of Koodli (US 6,633,575).

Regarding **claim 11** Silberschatz discloses a network device where each RED

policer includes:

a filter that determines a filtered virtual time debt **(The first step in this portion**

of the process is to determine an average global queue occupancy [figure 2a,

step 32] Preferably, the global average queue occupancy is determined using an

exponential weighted moving average filter, where the average is recomputed on

the arrival of each new packet at the buffer; for example see col 4 lines 12-26); and

a control law circuit that receives the filtered virtual time debt from the filter and

determines whether a packet should be dropped **(Once a global average queue**

occupancy is determined, it is compared to a maximum threshold. When the

average is greater than the maximum threshold, a packet drop is warranted [steps

34, 36]. Preferably, if average does not exceed the maximum threshold but is

greater than a minimum threshold [step 38], a dynamically generated probability

is determined [step 40] and applied; col 4 lines 27-40); and

Silberschatz, however, fails to expressly disclose a plurality of Random Early

Detection (RED) policers and a packet classifier that determines which packet should

go to which RED a policer.

Koodli discloses a packet communications network that divides packets into

multiple classes that are later subject to queue management technique such as RED.

(figure 2 and col 5 lines 55-67 discloses a simple queuing scheme where packets

are divided into 2 classes and then fed into their respective service queues.

Figure 3 and col 6 lines 60-65 discloses the packets in the service queues 310 are each policed by the RED technique).

It would have been obvious to one having ordinary skill in the art at the time the invention was made to modify Silberschatz's apparatus to utilize a system where the incoming packets are separated into multiple classes based on the type of packets. Each packet queue would then be subject to RED policing, as taught by Koodli. The motivation is a more efficient and higher performance system that provides a means of offering a spectrum of services in the Internet without the need for per-flow state and signaling in every router. By carefully aggregating a multitude of QoS-enabled flows into a small number of aggregates that are given a small number of differentiated treatments within the network, differentiated services eliminates the need to recognize and store information about each individual flow in core routers. This effort to scalability succeeds by combining a small number of simple packet treatments with a larger number of per-flow policing policies to provide a broad and flexible range of services, as shown by Koodli on col 2 lines 45-55.

Conclusion

12.   The prior art made of record and not relied upon is considered pertinent to applicant's disclosure.

The following patent is cited to show the state of the art with respect congestion control using random early detection:

US Patent (6,690,645) to Aweya et al

US Patent (6,144,639) to Zhao et al

US Patent (6,333,917) to Lyon et al

13.   Any inquiry concerning this communication or earlier communications from the

examiner should be directed to Alan Nguyen whose telephone number is 703-305-0369.

The examiner can normally be reached on 9am-6pm ET

If attempts to reach the examiner by telephone are unsuccessful, the examiner's

supervisor, Ricky Ngo can be reached on 703-305-4798. The fax phone number for the

organization where this application or proceeding is assigned is 703-872-9314.

Information regarding the status of an application may be obtained from the

Patent Application Information Retrieval (PAIR) system. Status information for

published applications may be obtained from either Private PAIR or Public PAIR.

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you have questions on access to the Private PAIR system, contact the Electronic

Business Center (EBC) at 866-217-9197 (toll-free).

AVN
April 7, 2004

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